Date: Fri, 18 Feb 94 04:30:27 PST
From: Ham-Ant Mailing List and Newsgroup <ham-ant@ucsd.edu>
Errors-To: Ham-Ant-Errors@UCSD.Edu
Reply-To: Ham-Ant@UCSD.Edu
Precedence: Bulk
Subject: Ham-Ant Digest V94 #38
To: Ham-Ant

Ham-Ant Digest Fri, 18 Feb 94 Volume 94 : Issue 38

Today's Topics:

Send Replies or notes for publication to: <Ham-Ant@UCSD.Edu>
Send subscription requests to: <Ham-Ant-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Ant Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-ant".

Date: Fri, 18 Feb 1994 03:54:25 GMT
From: agate!howland.reston.ans.net!vixen.cso.uiuc.edu!sdd.hp.com!col.hp.com!
srgenprp!alanb@network.ucsd.edu
Subject: 2m Groundplane Antenna Question
To: ham-ant@ucsd.edu

eric smith (ebs@csparc046.cirrus.com) wrote:
: I am trying to understand how bending the radials on a 1/4 wave
: groundplane antenna will effect the radiation resistance and
: radiation pattern of the antenna. ...

[eric built a ground plane antenna with radials bent down at 45 degrees
and got an SWR of 1:1, but the books say a GP antenna is 36 ohms.]

: Now for the quiz:

: 1. Why was the impedance 50 Ohms at resonance ?
: 2. Why a 45 deg bend ?

You said it in your posting. The farther down you bend the radials, the higher the impedance because the antenna acts more like a dipole.

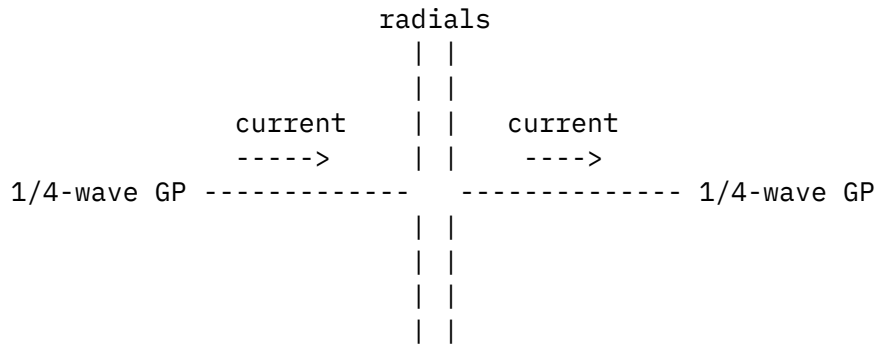
:   3. What happens to the radiation pattern when the radials are
:   bent at 45 deg ?

Good question. Assuming no feedline radiation, I will stick my neck out and guess that folding the radials down gives increased radiation in the below-the-horizon direction. i.e. it makes the antenna have a radiation pattern more like a dipole and less like a ground plane.

:   4. Why does a dipole have a radiation resistance of 70 Ohms ?
:   I think this is some how related to 377/4*pi, but I don't
:   know why this should be the case. The 377 comes from sqrt(mu/episilon).
:   Where does 70 come from ?

A 1/2-wave dipole is two 1/4-wave ground planes back-to-back. The impedance is therefore twice (about 72 ohms for the dipole and 36 ohms for the ground plane.)

I said that a dipole is equivalent to two GP's back to back, but what about the radials? Since the two GP's are fed out-of-phase, the currents in the radials will also be out-of-phase and thus cancel. So you can remove the radials with no effect.



The current flows away from the feedpoint in the left-hand radials and toward the feedpoint in the right-hand radials. (The current of course is AC -- it is illustrated at a specific instant of time.)

AL N1AL

Date: Wed, 16 Feb 1994 00:21:49 GMT
From: ucsnews!sol.ctr.columbia.edu!howland.reston.ans.net!agate!library.ucla.edu!csulb.edu!paris.ics.uci.edu!news.cwi.com!netcomsv!cirrus!csparc046!ebs@network.ucsd.edu

Subject: 2m Groundplane Antenna Question
To: ham-ant@ucsd.edu

I am trying to understand how bending the radials on a 1/4 wave groundplane antenna will effect the radiation resistance and radiation pattern of the antenna. I have some measured data that indicates that the magnitude of the impedance is increased when the radials are bent down away from the monopole element. This makes some sense intuitively since the resultant antenna is getting closer to being a dipole.

Here is some background info. I built a 2m groundplane antenna similar to those described in the ARRL Antenna Handbook. I used #6 solid copper wire for the monopole and the radial elements. I inserted the monopole element directly into a S0239 connector. I hammered the ends of the radials flat, bent them down at a 45 deg angle, drilled holes in them, screwed them in place and soldered them. I mounted the antenna on a pvc mast that kept the radials about 4 1/2 ft off of the ground. I started out with each element 24" long.

My plan was to bring the antenna into work and tune it up on our HP4396A Network Analyzer. I also planned to convert the antenna into a folded monopole to increase the impedance at resonance. My reading had indicated that a 1/4 wave groundplane antenna that was greater that 1/2 wavelength above ground, with a wavelength/diameter ratio of ~500/1, should have a radiation resistance of ~30 Ohms at resonance. I planned to increase the impedance with a folded element so that the total Z was close to 50.

To my surprise, when I hooked up the network analyzer I saw a SWR of 1.03 at 128MHZ with a 12MHZ range where the SWR was <1.5. Obviously, the impedance was already quite close to 50 Ohms at resonance. After tuning I got a SWR of 1.05 at 146MHZ with a SWR of <1.5 at both 140MHZ and 150MHZ. The tuned monopole element length was 18.5" and the radials were 19.5" each. The antenna is working great. I get 50dB better signal reports with this antenna vs my Kenwood TH28a rubber duck (at 146.78MHZ). No great surprise, I measured a SWR of ~9 with the duck at the same freq. The duck antenna has SWR of ~2 at 143MHZ with a very sharp roll-off.

Now for the quiz:

1. Why was the impedance 50 Ohms at resonance ?
2. Why a 45 deg bend ?
3. What happens to the radiation pattern when the radials are bent at 45 deg ?
4. Why does a dipole have a radiation resistance of 70 Ohms ? I think this is some how related to 377/4*pi, but I don't know why this should be the case. The 377 comes from sqrt(mu/episilon). Where does 70 come from ?

Any insights or references to appropriate texts would be appreciated.

Eric KC5EQI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Date: 17 Feb 1994 16:21:48 GMT
From: swrinde!elroy.jpl.nasa.gov!usc!howland.reston.ans.net!torn!csd.unb.ca!coranto.ucs.mun.ca!gdunphy@network.ucsd.edu
Subject: Effective Raditated Power?
To: ham-ant@ucsd.edu

root@jackatak.raider.net (Jack GF Hill) writes:

>tstein@monolith.d.umn.edu (Tom Stein) writes:

>> Say I have 40 watts coming out of the back of my radio. My feedline is
>> 1.4dB per 100 ft. I have 100 feet of feedline... Then my antenna, a 11 el.
>> beam has 11dB gain on it. Can someone tell me what the effective radiated
>> power of my system would be? And a formula would help....

>Oh oh. No calculator and the newseditor isn't gonna help: still, let's
>try...someone else will jump in after I take a shot and point out my
>puny math skills and bad memory... ;^)

>1.4db of attenuation is about 30% of your signal, so that means 12
>watts or 28 reaching the antenna.

>11db gain is about 11.25 times the 28 watts or..... geez, I am getting
>dizzy doing this.... 315 watts ERP

>OK, guys...for an old guy doing that all in the head without
>calculator, graph paper or "formulas", how'd I do?   ;^)
>73,
>Jack, W4PPT/Mobile (75M SSB 2-letter WAS #1657 -- all from the mobile! ;^)

You're just trying to make us calculator dependents look silly, aren't
you? If I remember correctly (and I'm too embarassed to get my
calculator out AGAIN) the number was 348.

--
Gerard Dunphy |"If you don't want to play with old geezers, you
gdunphy@engr.mun.ca | have to make golf a contact sport!" Calvin

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Date: Thu, 17 Feb 1994 12:52:39 GMT
From: pacbell.com!sgiblab!swrinde!cs.utexas.edu!howland.reston.ans.net!torn!nott!
cunews!freenet.carleton.ca!FreeNet.Carleton.CA!ae517@network.ucsd.edu
Subject: Radiation efficiency questions ...
To: ham-ant@ucsd.edu

In a previous article, gary@ke4zv.atl.ga.us (Gary Coffman) says:

>>Radiation efficiency has very little to do with resonance.
>
>True. A non-resonant antenna is just more difficult to drive efficently.
>
>>In both cases, as long as associated losses remain the same, the radiation
>>efficiency should be equal.
>
>Not true I think. To generate the same field, the shorter antenna will
>require a higher potential across it, and higher current flowing through
>it. So the shorter antenna will have increased I^2R losses given the same
>wire size.

Omigawsh, you're right! I guess suppose I should read these posts a little
more carefully before I "pontificate". Al Bloom made reference in
his post about the low value of radiation resistance that a short antenna
would have, which would probably make for an easier calculation of
radiation efficiency, though.

73 de VA3RR/AA8LU

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Date: Fri, 18 Feb 1994 03:15:54 GMT
From: spsgate!mogate!newsgate!dtsdev0!kinzer@uunet.uu.net
Subject: Short 2m/440MHz mobile antennas
To: ham-ant@ucsd.edu

I have a Diamond NR770R (tall) and a Comet B-10 (short) dual band antennas.
I commute on 70cm, and the Diamond works all the way home on 5 watts, and
the Comet gives out (my signal becomes difficult to copy) about 8 miles
from the repeater, about 4 miles from home. Neither has a problem on
45 watt output. This is not a wide area repeater though, with antenna
only 60 feet or so above local terrain.

-dave

Date: Fri, 18 Feb 94 03:08:32 GMT
From: agate!howland.reston.ans.net!math.ohio-state.edu!sdd.hp.com!
saimiri.primate.wisc.edu!news.crd.ge.com!sarah!eve.albany.edu!
gl8574@network.ucsd.edu
Subject: Short 2m/440MHz mobile antennas
To: ham-ant@ucsd.edu

In article <2k043m$9ff@xap.xyplex.com> sas@eng.xyplex.com writes:
>I'd
>like opinions on other brands of NMO mount dual band antenna elements
>that are 19 inches or less in length: how do they perform, how rugged
>and reliable are they, etc.

I have an alternative approach that may or may not work with your
setup, but it would keep you from having to give up having metal in
the air, if it is workable.

The local volunteer fire department (Selkirk, NY) uses a frequency of
46.06, and all of the aparati are equipped with 1/4 wave antennae.
Such an antenna is only slightly longer than a 5/8 wave for 2m. In
order to keep these from tangling with the garage doors, the antennae
have large springs on the base, and there is a plastic clip mounted
about 3/4 of the antenna's length away from the antenna's base, into
which the tip of the antenna is inserted before putting the equipment
inside the station. The clip is located on most of the equipment in
such a way that some member of the crew can reach out the window and
release it once they are on the road. The clip being plastic,
however, it does not short out the antenna, and therefore it is not
disasterous if the clip is not released--it just cuts down the range a
bit, but we have a crossband repeater to handle that problem -- Fire
control xmits on 455.6375 and is repeated to 46.06, and we talk on
46.06 which is relayed to fire control on 460.6375, and the range is
phenomenal, but I digress.

Perhaps if you can locate some sort of a plastic clip like the one I
described, you can get your antenna to clear 19 inches like you

wanted.
--
--
gl8574@cs.albany.edu
"Not a jock or a geek, not a nerd or a greek, not quite normal, not really a
 friek, just me.... Deal with it!"   -Critter

End of Ham-Ant Digest V94 #38
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